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1914

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

MIKISHI ABE

B.E., TOHOKU IMPERIAL UNIVERSITY, 1905

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

FRIDAY, MAY 22, 1914 1:30 P. M.

May 1914
Carroll
Lehmann
Whitten
Sears
Kichen
Mallinson
Stein



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Tlg 10de
1914
UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

MIKISHI ABE

B.E., TOHOKU IMPERIAL UNIVERSITY, 1905

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

FRIDAY, MAY 22, 1914, 1:30 P. M.

ROOM 300, LABORATORY OF APPLIED MECHANICS.

Committee in Charge:

PROFESSOR A. N. TALBOT

PROFESSOR ARNOLD EMCH

PROFESSOR E. R. DEWSNUP

PROFESSOR I. O. BAKER

PROFESSOR G. A. GOODENOUGH

PROFESSOR L. H. PROVINE

PROFESSOR H. F. MOORE

OUTLINE OF STUDIES

Major Subject: Engineering Mechanics

First Minor Subject: Mathematics

Second Minor Subject: Economics

Thesis: STATICALLY INDETERMINATE STRESSES IN RIGIDLY CONNECTED STRUCTURES OF REINFORCED CONCRETE

SUMMARY.

The investigations of reinforced concrete, both analytical and experimental, commonly have been made on simple members,—beams, columns, footings, etc. Many structures have been built with a combination of members rigidly connected in the form of a frame, and the outlook is that in the future there will be an extended use of such frames in a variety of forms. Little experimental work has been done on reinforced concrete frames, and analytical discussions of their action and of the stresses developed under load are much needed.

In this thesis the general method of attack of the analysis of statically indeterminate stresses in rigidly connected structures of reinforced concrete is outlined, and analyses are made and formulas derived for twenty-six forms of rigid frames. The applicability of such frames to engineering construction is pointed out.

In the experimental work five types of frames were investigated, eight frames in all being fabricated in the usual manner and tested. Gage lines were laid out at numerous points on these frames, and strain-gage measurements were taken during the tests. The observed deformation and the corresponding stresses have been recorded and discussed, and diagrams and tables give the principal results.

The test pieces were designed to bring out the elastic action of reinforced concrete frames under external load, including the amount and the distribution of the stresses, the continuity of the composing members, the reliability of such frames, and the applicability of the theoretical formulas in the design of frames.

The following is abstracted from the conclusions advanced:

(a) The agreement between analyses and tests is as close as may be expected in a composite structure of the nature of reinforced concrete.

(b) If a frame is carefully designed and well reinforced, there need be no anxiety as to the rigidity of a joint. The continuity of such members has been shown by the tests.

(c) Cracks, deflections, and form of final failure were as might be expected from the analysis of elastic action and the properties of the materials.

(d) Lateral bending and high stresses at interior angles should be taken into account in designing.

(e) The effect of the presence of footings is considered to give results which fall between those given by hinged ends and those given by fixed ends. A proper slope for columns may avoid the development of bending stress.

- 1905-1911 Assistant Engineer of the Imperial Government
Railways of Japan
- 1912-1914 Japanese Government Student at the University
of Illinois appointed by the Imperial Govern-
ment Railways of Japan and the Department
of Agriculture and Commerce

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

WILLIAM WALTER CORT

A.B., COLORADO COLLEGE, 1909

A.M., UNIVERSITY OF ILLINOIS, 1911

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

THURSDAY, MAY 21, 1914, 10 A. M.

ROOM 310, NATURAL HISTORY BUILDING.

Committee in Charge:

PROFESSOR H. B. WARD

PROFESSOR J. S. KINGSLEY

PROFESSOR CHARLES ZELNY

PROFESSOR WILLIAM TRELEASE

PROFESSOR S. A. FORBES

OUTLINE OF STUDIES

Major Subject: Zoology

First Minor Subject: Vertebrate Anatomy

Second Minor Subject: Entomology

Thesis: LARVAL TREMATODES FROM NORTH AMERICAN FRESH-WATER SNAILS.

SUMMARY

1. Larval Trematodes previously reported from North America.
2. Structures of sporocysts, rediae, and cercariae of fifteen new species from fresh-water snails.
3. Comparison with related species.
4. Revised classification of cercariae.
5. Foundation for future studies on North American larval trematodes,—a neglected subject.

1909-1912 Assistant in Zoology, University of Illinois
1912-1913 Instructor in Zoology, Colorado College
1913-1914 Fellow in Zoology, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

STANLEY PRINCE FARWELL

B.S., UNIVERSITY OF ILLINOIS, 1907

M.S., UNIVERSITY OF ILLINOIS, 1910

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

FRIDAY, MAY 22, 1914, 4 P. M.

ROOM 300, ELECTRICAL LABORATORY.

Committee in Charge:

PROFESSOR E. B. PAINE

PROFESSOR J. B. SHAW

PROFESSOR M. H. ROBINSON

PROFESSOR JACOB KUNZ

PROFESSOR MORGAN BROOKS

OUTLINE OF STUDIES

Major Subject: Electrical Engineering

First Minor Subject: Mathematics

Second Minor Subject: Economics

Thesis: THE CORONA PRODUCED BY CONTINUOUS
POTENTIALS

SUMMARY

1. Introduction.
 - (a) Description of the corona and previous work on the corona produced by continuous potentials.
 - (b) Statement of the problem.
2. Experimental investigation.
 - (a) The characteristic curve of the corona appearing around a central wire in a coaxial cylinder.
 - (b) Starting point of the corona for different polarities.
 - (c) Influence of the pressure, humidity, and diameter of the wire.
 - (d) Effect of confining air in tube upon characteristic curve.
 - (e) Chemical changes of the air.
 - (f) Instantaneous increase of pressure, due to ionization and not to heating effect of the current.
 - (g) Discontinuous discharges. Influence of moisture, pressure, and diameter.
 - (h) Effect of a short arc in series upon character of discharges.
 - (i) Proof that the discontinuous discharge is essentially a direct current phenomenon.
 - (j) Difference between positive and negative electricity made very apparent in this series of experiments.
 - (k) Simultaneous appearance of corona and ionization current for large wires. Not true for small wires.
 - (l) Mechanical vibrations.
 - (m) Two parallel wires. Appearance of the corona.
 - (n) Exploration of the field between parallel wires. Anode and cathode fall of potential.
3. Theoretical Discussion.
 - (a) Explanation of ionization by collision.
 - (b) Explanation of the distortion of the field through the ionization.
 - (c) On the origin of the light.
 - (d) Ionization by light.
 - (e) Mechanical analogy of discontinuous negative discharge.
 - (f) The mobility of the ions. Effect of moisture and pressure.
 - (g) Explanation of the ionization pressure.
 - (h) Possible principles for construction of high-tension voltmeters.

- 1900-1904 Western Electric Co., Chicago
- 1907-1908 Electrician, Oklahoma Gas and Electric Company, Oklahoma City
- 1908-1910 Assistant Professor of Electrical Engineering, Central University of Kentucky
- 1910-1913 Instructor in Theoretical and Applied Mechanics, University of Illinois
- 1913-1914 Fellow in Electrical Engineering, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

STANLEY BLACK FRACKER

A.B., BUENA VISTA COLLEGE, 1910

M.S., IOWA STATE COLLEGE, 1912

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

WEDNESDAY, MAY 20, 1914, 2 P. M.

ROOM 223 NATURAL HISTORY BUILDING

Committee in Charge:

PROFESSOR S. A. FORBES

PROFESSOR A. D. MACGILLIVRAY

PROFESSOR J. W. FOLSOM

PROFESSOR CHARLES ZELENY

PROFESSOR H. B. WARD

OUTLINE OF STUDIES

Major Subject: Systematic Entomology

First Minor Subject: Economic Entomology

Second Minor Subject: Zoology

Thesis: THE CLASSIFICATION OF LEPIDOPTEROUS
LARVAE
SUMMARY

PART ONE: HOMOLGY OF THE SETAE.

1. The study of homology is based on the phylogenetic development of the homologous organs.

2. The phylogenetic development of the setal plan of lepidopterous larvae is shown by the changes during successive instars and by comparative anatomy.

3. Comparative studies of the arrangement of the setae show that the setal plans of all segments of all the larvae of the order have developed from the same type.

4. The incomplete and misleading nature of former systems of naming the setae necessitates the abandonment of these schemes. A system of Greek letters is substituted.

5. Setae may be divided into four classes: primary, sub-primary, tufted, and secondary, to the first three of which the Greek letters are applied.

6. The most conspicuous cases of divergence from the generalized type of arrangement of the setae are to be noted on the second and third thoracic and the ninth abdominal segments.

7. The setal arrangement of the tenth abdominal segment does not indicate that it consists of more than one metamere.

PART TWO: CLASSIFICATION OF THE LARVAE.

8. The principal characters used in the classification of adult insects are not available in the study of immature Holometabola.

9. The larval structures of greatest use to the taxonomist are: (a) the head sclerites and ocelli, (b) the prolegs and their crochets, (c) the form of armature, especially the arrangement of the setae, (d) the shape and structure of the spiracles, (e) peculiar specializations, such as osmateria, gibbosities, etc.

10. Lines of division based on larval structure in most cases closely follow those based on imaginal characters, and, when carefully interpreted, are equally valuable to the taxonomist.

11. The most generalized lepidopterous larvae belong to the families Hepialidae, Acrolophidae, and Yponomeutidae.

12. The remaining families may be divided into four main groups; the tineoid series, the pyrali-zygaenoid series, the Bombycoidea, and the Rhopalocera.

13. Structural characters of the larvae separate these four groups, although these characters are sometimes obscured by the appearance of secondary ones.

14. A study of larvae shows that a sufficient number of characters are present in most groups to enable workers to identify the genera, and usually the species, of Lepidoptera as certainly and as easily from the larva as from the imago.

- 1910-1911 Assistant in Zoology, University of Michigan
1911-1912 Instructor in Zoology, Iowa State College
1912 Deputy State Entomologist of Iowa
1912-1913 Scholar in Entomology, University of Illinois
1913-1914 Fellow in Entomology, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION
OF

DENTON LORING GEYER

A.B., UNIVERSITY OF WISCONSIN, 1910

A.M., UNIVERSITY OF WISCONSIN, 1911

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

THURSDAY, MAY 21, 1914, 4 P. M.

ROOM 107, LINCOLN HALL.

Committee in Charge:

PROFESSOR A. H. DANIELS

PROFESSOR B. H. BODE

PROFESSOR MADISON BENTLEY

PROFESSOR W. C. BAGLEY

PROFESSOR C. M. MOSS

OUTLINE OF STUDIES

Major Subject: Philosophy

First Minor Subject: Ethics

Second Minor Subject: Psychology

Thesis: THE PRAGMATIC THEORY OF TRUTH AS
DEVELOPED BY PEIRCE, JAMES AND DEWEY.

SUMMARY.

1. C. S. Peirce, from whose writings the pragmatic theory of truth was worked out, restricted himself to stating a new philosophic method.
2. This principle in the writings of James came to mean both a method and a theory of truth.
3. In stating this theory of truth, James neglected to distinguish between results that are predominantly valuable and results that are simply fulfilments.
4. Dewey restricts truth to fulfilled expectations.
5. The theory as thus stated is a recognition by philosophy of the procedure of science.

1910-1911 Scholar in Philosophy, University of Wisconsin.

1911-1913 Fellow in Philosophy, University of Illinois.

1913-1914 Assistant in Philosophy, University of Illinois.

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

JOHN EARL GUTBERLET

A.B., BETHANY COLLEGE, 1909

A.M., UNIVERSITY OF ILLINOIS, 1911

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

FRIDAY, MAY 22, 1914, 10 A. M.

ROOM 310, NATURAL HISTORY BUILDING.

Committee in Charge:

PROFESSOR H. B. WARD

PROFESSOR CHARLES ZELENY

PROFESSOR C. F. HOTTES

PROFESSOR F. L. STEVENS

PROFESSOR A. D. MACGILLIVRAY

OUTLINE OF STUDIES

Major Subject: Zoology

First Minor Subject: Plant Physiology

Second Minor Subject: Entomology

Thesis: STUDIES ON DEVELOPMENT, MORPHOLOGY
AND ECONOMIC IMPORTANCE OF
CHICKEN CESTODES.

SUMMARY

1. Experimental evidence on the life-history of *Choanotaenia infundibuliformis*, showing the intermediate host to be the house-fly (*Musca domestica*).
2. Morphology of the cysticerous and adult.
3. Some points on the morphology of four other species (*Davainea cesticillus*, *D. tetragona*, *D. echinobothridia*, *Hymenolepis carioca*) of chicken cestodes.
4. Amount of infection present in flocks of chickens.
5. Symptoms and effects of tapeworm infection.
6. Methods of control and prevention.

1909-1910 Assistant in Zoology, University of Colorado
1910-1913 Assistant in Zoology, University of Illinois
1913-1914 Fellow in Zoology, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION
OF

HARRY FIELDING HADLEY

A.B., JAMES MILLIKEN UNIVERSITY, 1911

A.M., UNIVERSITY OF ILLINOIS, 1912

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

WEDNESDAY, MAY 20, 1914, 3 P. M.
ROOM 106, CHEMISTRY LABORATORY

Committee in Charge:

PROFESSOR W. A. NOYES
PROFESSOR D. F. MCFARLAND
PROFESSOR O. RAHN
PROFESSOR C. G. DERICK
PROFESSOR S. W. PARR

•

OUTLINE OF STUDIES

Major Subject: Inorganic Chemistry

First Minor Subject: Physical Chemistry

Second Minor Subject: Mineralogy

Thesis: PHENOL EXTRACTION METHODS AS APPLIED
TO COAL AND A STUDY OF THE RESULTING
COMPOUNDS.

SUMMARY

I. The ultimate and approximate methods of analysis for coal give little information as to the type or characteristics of that material; the values obtained refer to material which is the result of decomposition of the coal.

II. A study of solvents for the purpose of subdividing coal constituents without decomposition was carried out. A list of solvents made use of in the order of their activity was as follows: phenol, ortho-cresol, low boiling tar distillate, para-cresol, pyridine, phenol-toluene, benzene, carbon disulphide, and turpentine.

III. Phenol as the most active solvent was adopted for purposes of this investigation. An apparatus was devised for carrying on the extraction so that the temperature of the solvent would be above 110°C .

IV. The degree of success in use of the method depends on the fact of subdivision without decomposition of the coal, and upon a minimum decomposition of the solvent.

V. Freeing the subdivisions of the solvent required a temperature above 178° , the boiling point of phenol. Evidence that this temperature could be applied without decomposition provided oxygen was excluded.

VI. The soluble substance is shown to have properties which indicate its original source as being resinic in type; the insoluble substance being the degradation products of cellulose material.

VII. The subdivisions of coal thus obtained may be made to serve the following purposes:—

(a) The amount of soluble material seems to differentiate sharply between subdivisions of coal types. On the ash and moisture free basis the high volatile coals of Vermilion County gave 36.22 per cent of soluble material; the lower volatile coals as of Williamson County show 28.24 per cent of soluble material.

(b) The coking properties of coal are directly related to the characteristics belonging to the soluble material. Oxygen absorbed is chemically held and after a certain amount destroys the coking effect.

(c) While both subdivisions easily absorb oxygen the greater avidity is present in the insoluble material or cellulose product. Storage of coal and the tendency to spontaneous combustion are chiefly dependent on the property of this subdivision.

1909-1911 Laboratory Assistant in Chemistry, James Milliken University.

1911-1912 Graduate Assistant in Chemistry, University of Illinois.

1912-1914 Fellow in Engineering Experiment Station, University of Illinois.

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

FELIX EMIL HELD

A.B., COLLEGE OF EMPORIA, 1902

A.M., COLLEGE OF EMPORIA, 1908

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

MONDAY, MAY 25, 1914, 3 P. M.

ROOM 217, LINCOLN HALL.

Committee in Charge:

PROFESSOR J. GOEBEL

PROFESSOR O. E. LESSING

PROFESSOR A. S. PEASE

PROFESSOR N. C. BROOKS

PROFESSOR H. J. BARTON

OUTLINE OF STUDIES

Major Subject: German Literature

First Minor Subject: German Philology

Second Minor Subject: Latin

Thesis: JOHANN VALENTIN ANDREAE'S CHRISTIAN-
OPOLIS, A UTOPIA OF THE SEVENTEENTH
CENTURY.

SUMMARY

1. The Christianopolis is not a copy or an adaptation of earlier utopias, but an independent and original production.

2. A comparison of Francis Bacon's New Atlantis with the Christianopolis suggests a strong probability that Bacon was acquainted, directly or indirectly, with the latter.

3. Nova Solyma, an "Ideal City", appearing anonymously in 1648, attributed by the Rev. Walter Begley to John Milton, but now known to be the work of Samuel Gott, shows direct influence of the Christianopolis.

4. Andreae's system of education and scientific experiment as outlined in the Christianopolis, had an important effect through John Amos Comenius, Samuel Hartlib, John Dury and others, upon the founding of the Royal Society of London and upon the development of Natural Philosophy and experimental Science in the seventeenth century.

1902-1903 Principal of High School, Dodge City, Kansas
1903-1906 Principal of Academy, College of Emporia
1906-1911 Dean, College of Emporia
1911-1914 Assistant in German, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

EDWARD OTTO HEUSE

B.S., HANOVER COLLEGE, 1900

M.S., UNIVERSITY OF ILLINOIS, 1907

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

TUESDAY, MAY 19, 1914, 2 P. M.

ROOM 106, CHEMISTRY LABORATORY.

Committee in Charge:

PROFESSOR W. A. NOYES

PROFESSOR E. W. WASHBURN

PROFESSOR C. W. BALKE

PROFESSOR JAKOB KUNZ

PROFESSOR C. T. KNIPP

OUTLINE OF STUDIES

Major Subject: Physical Chemistry

First Minor Subject: Inorganic Chemistry

Second Minor Subject: Physics

Thesis: THE VAPOR PRESSURES OF AQUEOUS SOLUTIONS OF ELECTROLYTES.

SUMMARY

1. PURPOSE OF THE INVESTIGATION.—For the study of substances in solution at different concentrations, but constant temperature, the best method available is that of Vapor Pressure Measurements.

2. METHOD.—The method used is the air-saturation method, so modified as to overcome its two chief sources of error; namely, error due to measurement of the volume of the air and error due to lack of uniformity of temperature.

3. APPARATUS.—This consists in the main of three saturators and three absorbers, two of the saturators containing pure water, and the third containing the solution under investigation. There are also stirrers, heaters, etc.

4. RESULTS, AND THEIR INTERPRETATION.—The accuracy of the method was tested by using water in all three of the saturators. This gave values for the Relative Lowering as low as 0.00003. The other substances used were Potassium Chloride, Lithium Chloride, and Cane Sugar, each in Normal and Half Normal Solution.

- 1907-1908 Instructor in Chemistry and Physics, Streator
 Township High School
- 1908-1912 Professor of Chemistry and Physics, Upper Iowa
 University
- 1912-1914 Fellow in Chemistry, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

INGEBRIGT L. LILLEHEI

A.B., UNIVERSITY OF MINNESOTA, 1908

A.M., UNIVERSITY OF MINNESOTA, 1909

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

SATURDAY, MAY 23, 1914, 9 A. M.

ROOM 209, LINCOLN HALL.

Committee in Charge:

PROFESSOR G. T. FLOM

PROFESSOR JULIUS GOEBEL

PROFESSOR T. E. OLIVER

PROFESSOR A. H. DANIELS

PROFESSOR L. M. LARSON

OUTLINE OF STUDIES

Major Subject: Scandinavian Languages

First Minor Subject: French

Second Minor Subject: Philosophy

Thesis: ARNE GARBORG.

SUMMARY

General Statement: An examination of his language and a study of his literary works with the main emphasis upon the ideas rather than upon the technique.

1. Garborg's language.—Three main types, A, B, C, respectively, are analyzed and the works in which they obtain are indicated.

2. The main facts of Garborg's life are given; a brief study of the milieu in which his childhood and early youth were passed.

3. An exposition of his main literary work with comments and references to the cultural environment.

4. Garborg's literary activity with special reference to his development and the currents of culture with which he came in contact.

1909-1910, Instructor in French, State College of Washington.

1911-1913 Assistant in Romance Languages, University of Illinois.

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

HAROLD HOSSACK MCGREGOR

A.B., McMASTER UNIVERSITY, 1910

M.S., UNIVERSITY OF LOUISVILLE, 1912

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

TUESDAY, MAY 19, 1914, 1 P. M.

ROOM 106, CHEMISTRY LABORATORY.

Committee in Charge:

PROFESSOR W. A. NOYES

MR. C. G. MACARTHUR

PROFESSOR C. G. DERICK

DR. J. H. BEARD

DR. LAMBERT THORP

OUTLINE OF STUDIES

Major Subject: Physiological Chemistry.

First Minor Subject: Organic Chemistry

Second Minor Subject: Physiology

Thesis: PROTEINS OF THE CENTRAL NERVOUS SYSTEM.

SUMMARY

Positive: 1. A new method of preparing tissues for direct quantitative estimation of the protein content. Method consists in extracting the greater portion of lipoids with a dilute solution of alcohol in benzene after drying the tissue in an air current. After such treatment the protein is readily extracted by suitable solvents.

2. Water extracts about 10 per cent. of the dry lipoid-extracted material. Dilute sodium hydroxid extracts 20 per cent. more protein.

3. It is probable that the total protein extracted by water is an individual and not a mixture.

4. The new protein contains P.Fe.S.

5. The brain of rabbit, sheep, ox, dog and man contain, in general, similar proteins.

6. The different divisions of the brain contain similar proteins, e.g., cerebrum, cerebellum, medulla.

Negative: 1. The central nervous system contains no true "globulin" as described by Halliburton. Journ. Physiol. 15, 90, 1894.

2. The nucleoprotein as prepared by Halliburton's method represents only a fraction of the total protein and is probably a splitting product of the more complex protein.

3. Acid Metaprotein, described by Marie, (C.R. 70, 322) does not exist preformed in the brain.

4. Coagulation by boiling in presence of very dilute acid does not yield the total proteins intact.

1910-1912 Assistant in Chemistry, University of Louisville
1912-1914 Fellow in Chemistry, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

EARL BOWMAN MILLARD

A.B., UNIVERSITY OF COLORADO, 1910

A.M., UNIVERSITY OF WISCONSIN, 1911

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

WEDNESDAY, MAY 20, 1914, 2 P. M.

ROOM 106, CHEMISTRY LABORATORY.

Committee in Charge:

PROFESSOR W. A. NOYES

PROFESSOR E. W. WASHBURN

PROFESSOR C. W. BALKE

PROFESSOR JAKOB KUNZ

PROFESSOR C. T. KNIPP

OUTLINE OF STUDIES

Major Subject: Physical Chemistry

First Minor Subject: Inorganic Chemistry

Second Minor Subject: Physics

Thesis: THE HYDRATION OF IONS AS DETERMINED BY
TRANSFERENCE MEASUREMENTS

SUMMARY

The following points have been established by means of transference experiments on 1.2 normal aqueous solutions of NaCl and CsCl in the presence of Raffinose, a non-electrolyte which was used as a reference substance in determining the migration of the water with the ions:

1. Washburn's statement that the sodium ion is more hydrated than the potassium ion and less hydrated than the lithium ion, has been confirmed by an experiment in which results were obtained from both electrodes.

2. The cesium ion carries much less water than the potassium ion, but more water than the chloride ion.

3. By an experiment on a 0.05 normal solution of a binary electrolyte, one of whose ions is much more highly hydrated than the other, (LiCl), it has been found that a 25% increase in the viscosity of the solution (produced by adding 0.15 mole of raffinose per liter) produces no change in the transference number. A similar experiment, in which a 60% increase was made in the viscosity, gives the same result.

4. The direction and order of magnitude of water transference in a 1.2 normal solution of potassium nitrate have been determined.

1908-1910 Assistant in Chemistry, University of Colorado
1910-1911 Assistant in Chemistry, University of Wisconsin
1911-1913 Assistant in Chemistry, University of Illinois
1913-1914 Fellow in Chemistry, University of Illinois

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

HUBERT LEONARD OLIN

A.B., UNIVERSITY OF IOWA, 1908

M.S., UNIVERSITY OF ILLINOIS, 1911

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

FRIDAY, MAY 22, 1914, 2 P. M.

ROOM 106, CHEMISTRY LABORATORY

Committee in Charge:

PROFESSOR W. A. NOYES

PROFESSOR S. W. PARR

PROFESSOR D. F. MCFARLAND

PROFESSOR R. T. STULL

PROFESSOR E. BARTOW

PROFESSOR C. G. DERICK

OUTLINE OF STUDIES

Major Subject: Industrial Chemistry

First Minor Subject: Ceramics

Second Minor Subject: Organic Chemistry

Thesis: THE COKING OF COAL AT LOW TEMPERATURES WITH SPECIAL REFERENCE TO THE PROPERTIES AND THE COMPOSITION OF THE PRODUCTS.

SUMMARY

I. Coal of the Illinois type can be treated so as to yield a coke of good texture and especially well adapted:—

(a) To domestic use and all purposes where a smokeless fuel is desired.

(b) For use in suction gas producers or similar devices for supplying fuel to internal combustion engines where the absence of tar is essential.

II. The tars produced by low temperature distillation have special properties quite distinct from ordinary gas tars.

(a) The specific gravity is low, 1.07 as compared with 1.17 for common coal tar. This indicates a high percentage of light oil and a low per cent of free carbon, 38.0% and 1.35% respectively.

(b) The “tar acids” are high, averaging 30%. This is the active principle in wood preserving processes now most in vogue, and is double the average amount in ordinary tar. Large importations of tar are now necessary to meet the demand.

(c) Naphthalene is practically absent, the light fraction has limited “drying” properties, and perhaps more positive value as motor distillate. The heavy oil is paraffine in type and would serve as Diesel Engine oil or carbureating material for water gas. The pitch residue is of especial value on account of the low content of free carbon.

- 1908-1910 Instructor in Chemistry, University of Oklahoma
 Preparatory School.
- 1910-1912 Fellow in Engineering Experiment Station, Uni-
 versity of Illinois.
- 1912-1913 Assistant in Chemistry, University of Illinois.
- 1913-1914 Instructor in Chemistry, Vassar College.

UNIVERSITY OF ILLINOIS

THE GRADUATE SCHOOL

FINAL EXAMINATION

OF

ORRIN HAROLD SMITH

A.B., KNOX COLLEGE, 1908

A.M., UNIVERSITY OF ILLINOIS, 1909

FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

MONDAY, MAY 25, 1914, 4 P. M.

ROOM 201, PHYSICS BUILDING

Committee in Charge:

PROFESSOR A. P. CARMAN

PROFESSOR C. T. KNIPP

PROFESSOR JAKOB KUNZ

PROFESSOR E. J. TOWNSEND

PROFESSOR F. R. WATSON

PROFESSOR W. F. SCHULZ

OUTLINE OF STUDIES

Major Subject: Experimental Physics

First Minor Subject: Theoretical Physics

Second Minor Subject: Mathematics

Thesis: RETROGRADE RAYS FROM THE COLD CATHODE.

SUMMARY

A study of "Retrograde Rays" by the photographic method at distances approximately within the mean free path has given traces on the photographic plate which with their measurements:—

I Show that,—

- 1 For residual air, molecules of hydrogen appear,—no atoms of the same being found on any of the plates. There are also heavier carriers present, some of which are probably oxygen molecules.
- 2 No difference in the result was found in an experiment where helium was present in the tube.
- 3 The rays can be obtained with a much smaller opening than Thomson used which allows of more accurate measurements.
- 4 The most favorable gas pressure for these retrograde rays lies between .008 and .015 mm. of mercury.

II Give evidence that the power that a moving particle has to affect a photographic plate is a function of its kinetic energy, the minimum being about 6.5×10^{-9} ergs.

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